

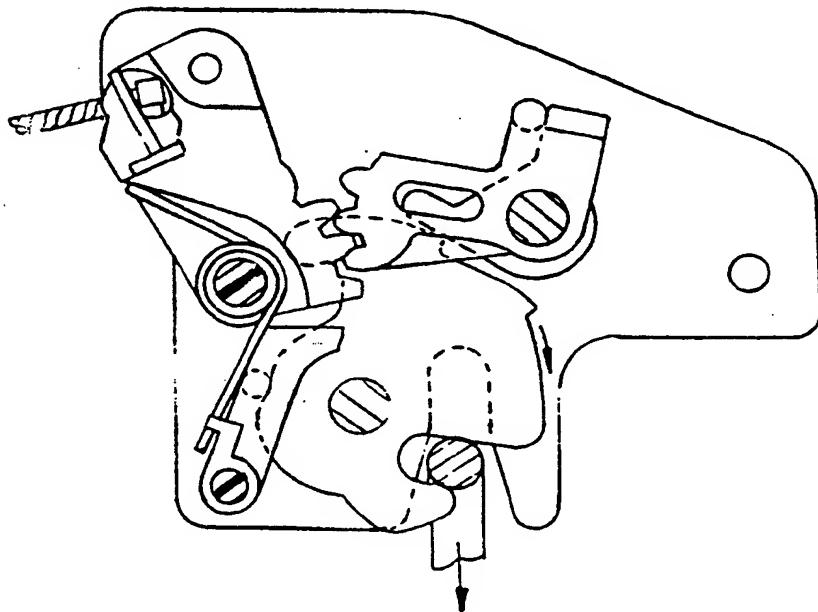
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: LIFTGATE LATCH

## (57) Abstract

A device which establishes a sequence for the modes of operation of a door. The sequence is latched, ajar, open and safety. The modes of operation are achieved by the interaction of a striker (16) and a striker forkbolt (20). The striker forkbolt (20) is secured to the door and the striker (16) is secured to the fixed structure. The striker forkbolt (20) is rotatable about a first axis (22) to various predetermined angular positions. The striker catch may be restricted to various rotational positions to accomplish one of the four modes of operation. A first angular restriction of the striker catch in which the striker forkbolt (20) is engaged with a striker (16) defines the latched mode of operation. A second angular restriction allows unrestricted rotation of the striker forkbolt (20) between the first limit of rotation and a maximum limit of rotation in which the striker forkbolt (20) and the striker (16) may be disengaged upon application of a force attempting to displace the door to an ajar position. A third range of angular positions of the striker forkbolt (20) occurs upon rotation of the striker forkbolt (20) to the maximum limit of rotation whereupon the striker forkbolt (20) and the striker (16) are completely disengaged permitting the door to be positioned in an open mode of operation. The fourth range of angular positions occurs in which the striker catch is restricted to a second limit of rotation in which the striker forkbolt (20) engages the striker (16) defining a safety mode of operation.



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## LIFTGATE LATCH

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BACKGROUND OF THE INVENTION

10 This invention relates to latches for securing the position of a door, and more specifically, to a latch which will control a door position according to a predetermined sequence of modes of operations.

DESCRIPTION OF THE RELATED ART

15 A typical vehicle door includes a latch which defines three modes of operation. A first mode is a latched mode in which a striker forkbolt is engaged to a striker. A second mode of operation is an open mode of operation in which the striker forkbolt and striker are released and function independently to provide access to a vehicle. A third mode of operation is  
20 one in which the striker forkbolt and striker are partially engaged allowing limited motion of a door which has been partially closed or which has been released incompletely from a latched condition to a mode of operation referred to as safety or secondary mode. The sequence of opening a vehicle door in which the door is rotatable about a horizontally oriented axis such as a deck  
25 lid includes a first step of releasing the vehicle door from a latched mode of operation, whereupon a weatherstrip imparts a force against the door causing an upwardly directing motion thereof. Upon reaching the limit of such displacement, the door returns to a position resting against the weatherstrip, and in some situations, engaging the striker forkbolt and striker sufficiently  
30 to reach a safety mode of operation. A vehicle operator inside such a vehicle attempting to open the door will find the door in a safety mode of operation, and consequently impossible to open. Therefore, it is desirable to provide a vehicle door which offers a sequence of operations in which the door is first released from a latched condition to an ajar condition in which no safety mode of operation is available. Subsequent to the ajar condition the vehicle  
35 door may then pass to an open position in which the safety mode of

operation is reset and may be utilized upon subsequent attempts to close the door.

SUMMARY OF THE PRESENT INVENTION

5        The present invention includes a device which establishes a sequence for the modes of operation of a door. The sequence is latched, ajar, open and safety. The modes of operation are achieved by the interaction of a striker and a striker forkbolt. The striker forkbolt is secured to the liftgate and the striker is secured to the fixed structure. The striker forkbolt is rotatable  
10      about a first axis to various predetermined angular positions. The striker forkbolt may be restricted to various rotational positions to accomplish one of the four modes of operation. A first angular restriction of the striker forkbolt in which the striker forkbolt is engaged with a striker defines the latched mode of operation. A second angular restriction allows unrestricted  
15      rotation of the striker catch between the first limit of rotation and a maximum limit of rotation in which the striker forkbolt and the striker may be disengaged upon application of a force attempting to displace the liftgate to an ajar position. A third range of angular positions of the striker catch occurs upon rotation of the striker forkbolt to the maximum limit of rotation  
20      whereupon the striker forkbolt and the striker are completely disengaged permitting the door to be positioned in an open mode of operation. The fourth range of angular positions occurs in which the striker forkbolt is restricted to a second limit of rotation in which the striker forkbolt engages the striker defining a safety mode of operation. The invention includes a pawl  
25      which is selectively rotatable about a second axis and may be engaged with cooperating abutment surfaces defined on the striker forkbolt to provide various rotational restrictions thereof. The pawl is maintained in a first position engaging a first radially extending abutment surface to define the latched condition. The pawl is maintained in a second angularly displaced  
30      position which prevents the pawl from engaging the striker forkbolt to define an ajar mode of operation in which the striker forkbolt is free to rotate from the latched condition to a maximum limit of rotation. The pawl is maintained

in a third condition in which the pawl is compliantly urged into contact with the rotatable striker forkbolt to define an open mode of operation. Finally, the pawl is maintained in a fourth condition engaged with a second cooperating radially extending abutment surface of the striker forkbolt to define a safety mode of operation. The preferred embodiment of the present invention includes a first rotatable member engaged with the pawl drivingly engaged to a second member. The second member may be selectively restricted in rotation by an engagement with a third member. Such a restriction of rotation of the second member thereby restricts rotation of the first member defining a displaced position of the pawl which permits the vehicle door to be operated in an ajar condition in which the door will not enter the safety mode of operation until it has been displaced into the position defined by the open mode of operation.

These and other aspects of the present invention will become more readily apparent by reference to the following detailed description of the embodiments as shown in the drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a structure including a door which is controlled by the apparatus of the present invention;

Figure 2 is a plan view of a first plane of the components of the present invention illustrating the latched mode of operation;

Figure 3 is a plan view of a first plane of the components of the present invention illustrating an ajar mode of operation;

Figure 4 is a plan view of the second plane of the components of the present invention illustrating the latched mode of operation;

Figure 5 is a plan view of the second plane of the components of the present invention illustrating the ajar mode of operation;

Figure 6 is a plan view of the first plane of the components of the present invention illustrating an open mode of operation; and

Figure 7 is a plan view of the first plane of the components of the present invention shown in a safety mode of operation.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention comprises an apparatus for establishing a mode of operation of a vehicle door 10 as shown in Figure 1, secured to the fixed structure of an automobile 14 having striker assembly 16 engageable with the apparatus of the present invention 18. The apparatus of the present invention is secured to the vehicle door 10 and is utilized to define and establish various modes of operation of vehicle door 10. The apparatus of the present invention constitutes an assembly of components which may be viewed in various perspectives and for purposes of simplified description will be discussed as viewed in two planes. A first plane of operation may be viewed in Figures 2 and 3 including a striker forkbolt 20 rotatable about a first axis 22. In addition, striker loop 24 is shown engaged to striker forkbolt 20. A pawl 26 rotatable about a second axis 28 includes a radially extending member 30 shown engaged with a cooperating abutment surface 32, thereby defining a restriction of rotation of striker forkbolt 20. This completes the description of the positional inter-relationship of pawl 26 and striker forkbolt 20, defining a latched mode of operation. Figure 3 illustrates the positional inter-relationship of striker forkbolt 20 and pawl 26 to define an ajar mode of operation. As is illustrated, the radially extending member 30 is rotatably displaced to a position which provides no restriction of rotation of striker forkbolt 20. Figures 4, 5, 6 and 7 provide views of the first and second planes of the present invention, illustrating the mechanism which establishes the position of pawl 26 including release lever 34 which is rotatably engaged with pawl 26. Release lever 34 is drivingly engaged with actuator lever 36 which is rotatably secured about third axis 38. A release lever holder 40 is rotatably fixed about fourth axis 42 and defines an abutment surface 44 engageable with cooperating surface 46 of actuator lever 36 to define the ajar mode of operation shown in Figure 5. As previously illustrated in Figure 3, in the ajar mode of operation, pawl 26 is maintained in a position of rotation free from any engagement with striker forkbolt 20 providing unrestricted rotation between a latched mode of operation as shown in Figure 6 and a maximum limit of rotation of striker forkbolt 20 shown in Figure 4. As shown

in Figure 6, release lever holder 40 includes a cam-follower portion 50 which follows a cam profile 51 defined substantially by radius R1 and R2 defined on striker forkbolt 20. Upon rotation of striker forkbolt 20 to an open position as shown in Figure 6, cam-follower 50 is displaced laterally by a dimension 5 equal to R2 minus R1 thereby releasing abutment surface 44 from cooperating abutment surface 46 permitting actuator lever 36, release lever 34, and pawl 26 to be compliantly urged by spring 210 into contact with cooperating abutment surface 32 of radially extending surface 54 of striker forkbolt 20, therein defining an open mode of operation. A final mode of 10 operation, as shown in Figure 7, is defined by the consequence of incomplete closure of door 10, whereupon striker forkbolt 20 engaged with striker loop 24 is partially rotated about first axis 22 such that radially extending member 30 engages with a cooperating abutment surface 32 defined on striker forkbolt 20. The angular restriction of rotation defined by engagement of the 15 respective structures establishes a relative range of rotation of pawl 26 and striker forkbolt 20 which is referred to as the safety mode of operation. Further closing force imposed upon door 10 causes further rotation of striker forkbolt 20 to accomplish the latched mode of operation illustrated in Figure 6. It may be noted that actuator lever 36 can be rotatably displaced from a 20 latched mode of operation to an ajar mode of operation by an actuator establishing a selected position by electromotive force or manually operated cable 60.

One skilled in the art will readily recognize that certain specific details shown in the foregoing specification and drawings are exemplary in nature 25 and subject to modification without departing from the teachings of the disclosure. Various modifications of the invention discussed in the foregoing description will become apparent to those skilled in the art. All such variations that basically rely on the teachings through which the invention has advanced the art are properly considered within the spirit and scope of the 30 invention.

## I Claim:

1. An apparatus for establishing a mode of operation of a door for providing a range of positional interrelationships with respect to a fixed structure including a striker secured to said fixed structure which is selectively engageable with a striker forkbolt secured to said door and rotatable about a first axis to predetermined angular positions with respect to said striker; said apparatus comprising:

5 10 means to selectively restrict the angle of rotation of said striker forkbolt to accomplish four modes of operation;

15 a first angular restriction defining a first limit of rotation of said striker forkbolt in which said striker forkbolt is engaged with said striker restricting displacement therebetween defining a latched mode of operation;

20 a second angular restriction allowing unrestricted rotation of said striker forkbolt between said first limit of rotation and a maximum limit of rotation allowing said striker forkbolt and said striker to disengage upon application of a force to said liftgate displacing said liftgate from said latched mode of operation to an ajar mode of operation;

25 a third range of angular positions wherein said striker forkbolt may be rotated by engagement with said striker into a position in which rotation of said striker forkbolt is restricted defining an open mode of operation; and

30 a fourth range of angular positions wherein said striker forkbolt rotation is restricted to a second limit of rotation in which said striker forkbolt engages said striker permitting a limited range of displacement between said door and said fixed structure defining a safety mode of operation.

2. The invention of Claim 1 wherein said means to selectively restrict the angle of rotation of said striker forkbolt comprises a pawl selectively rotatable about a second axis having a first radially extending portion selectively engageable with first and second cooperating radially extending abutment surfaces defined on said striker forkbolt to restrict rotation thereof wherein said pawl is maintained in a first condition engaging said first radially extending abutment surface to define said latched mode of operation; said pawl is maintained in a second condition preventing said pawl from engaging said striker forkbolt to define said ajar mode of operation; said pawl is maintained in a third condition compliantly urged into engagement with said striker forkbolt to define said open mode of operation; and, said pawl is maintained in a fourth condition engaged with said second cooperating radially extending abutment surface of said striker forkbolt to define said safety mode of operation.

15

3. The invention of Claim 1 wherein said means to selectively restrict the angle of rotation of said striker forkbolt comprises:

a first member rotatably engaged with said pawl; and

20

means for selectively restricting rotation of said first member thereby defining said second condition of said pawl in which said pawl is prevented from engaging with said striker to define said ajar mode of operation.

4. The invention of Claim 3 wherein said means for selectively restricting rotation of said first member comprises:

a second member drivingly engaged to said first member; and

5

means for selectively restricting rotation of said second member thereby defining said second condition of said pawl in which said pawl is prevented from engaging said striker forkbolt to define said ajar mode of operation.

10

5. The invention of Claim 1 wherein said means to selectively restrict the angle of rotation of said striker catch comprises:

a first member rotatably engaged with said pawl;

15

a second member drivingly engaged to said first member; and

20

a third member selectively engageable with cooperating abutment surfaces defined on said second member restricting rotation of said second member upon engagement therewith and thereby defining said second condition of said pawl in which said pawl is prevented from engaging said striker forkbolt to define said ajar mode of operation.

25

6. The invention of Claim 1 wherein said pawl is rotatably connected to a force actuator defining a rotary position thereof including a first rotary position defining said latched mode of operation and a second rotary position defining said ajar mode of operation.

30

7. The invention of Claim 5 wherein said third member is disengaged from said cooperating abutment surface defined on said second member in response to a force applied thereto by an abutting surface defined on said striker forkbolt to establish said safety mode of operation.

8. An apparatus for establishing a mode of operation of a liftgate for providing a range of positional interrelationships with respect to a fixed structure including a striker secured to said fixed structure which is selectively engageable with a striker forkbolt secured to said door and 5 rotatable about a first axis to predetermined angular positions with respect to said structure, and

said apparatus comprising:

10 means to selectively restrict the angle of rotation of said striker forkbolt to accomplish four modes of operation;

15 a first angular restriction defining a first limit of rotation of said striker forkbolt in which said striker forkbolt is engaged with said striker, restricting displacement therebetween, defining a latched mode of operation;

20 a second angular restriction allowing unrestricted rotation of said striker forkbolt between said first limit of rotation and a maximum limit of rotation allowing said striker forkbolt and said striker to disengage upon application of a force to said door displacing said door from said latched mode of operation to an ajar mode of operation;

25 a third range of angular positions wherein said striker catch may be rotated by engagement with said striker into a position in which rotation of said striker forkbolt is restricted defining an open mode of operation;

30 a fourth range of angular positions wherein said striker forkbolt rotation is restricted to a second limit of rotation in which said striker forkbolt engages said striker permitting a limited range of displacement between said door and said fixed structure defining a safety mode of

operation;

5        said means to selectively restrict the angle of rotation of said striker  
      forkbolt comprises a pawl selectively rotatable about a second axis  
      having a first radially extending portion selectively engageable with first  
      and second cooperating radially extending abutment surfaces defined  
      on said striker forkbolt to restrict rotation thereof wherein said pawl is  
      maintained in a first condition engaging said first radially extending  
10      abutment surface to define said latched mode of operation; said pawl  
      is maintained in a second condition preventing said pawl from engaging  
      said striker to define said ajar mode of operation;  
  
15      said pawl is maintained in a third condition compliantly urged into  
      engagement with said striker forkbolt to define said open mode of  
      operation; and  
  
      and said pawl is maintained in a fourth condition engaged with said  
      second cooperating radially extending abutment surface of said striker  
      forkbolt to define said safety mode of operation.

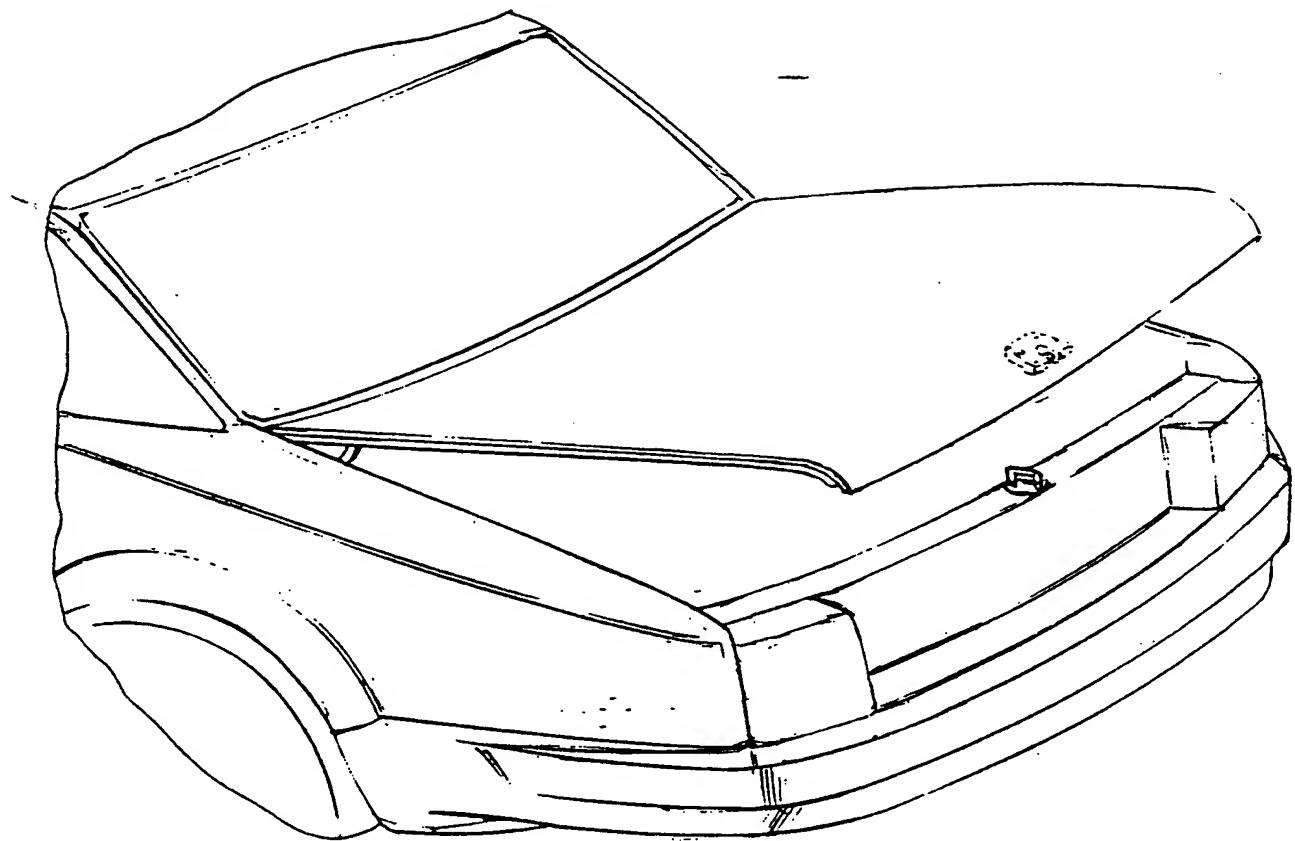


FIG - 1

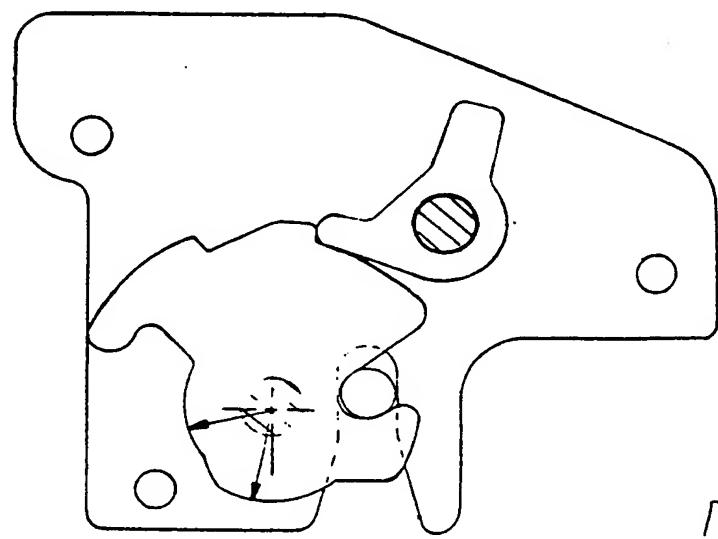
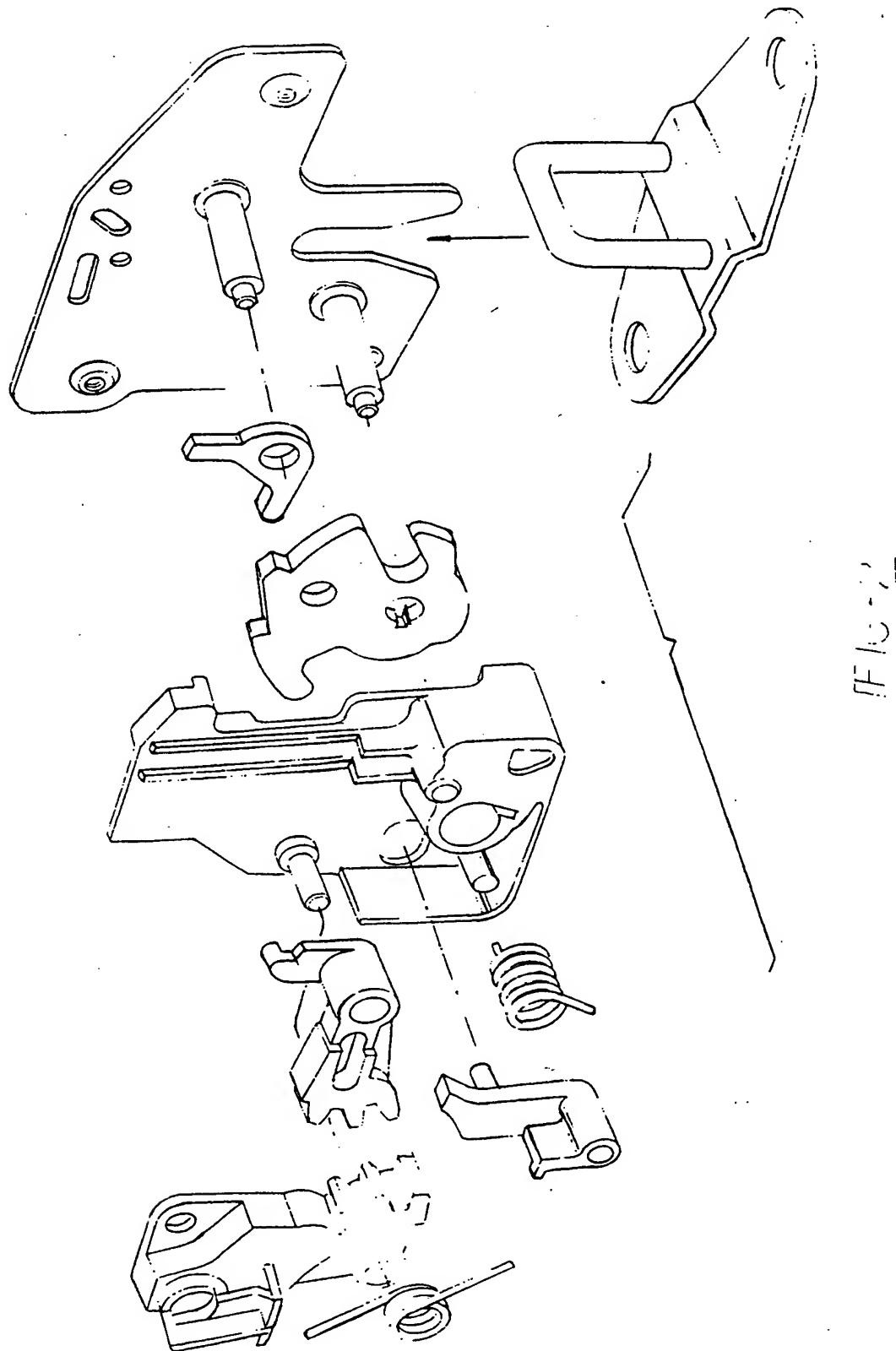


FIG - 3



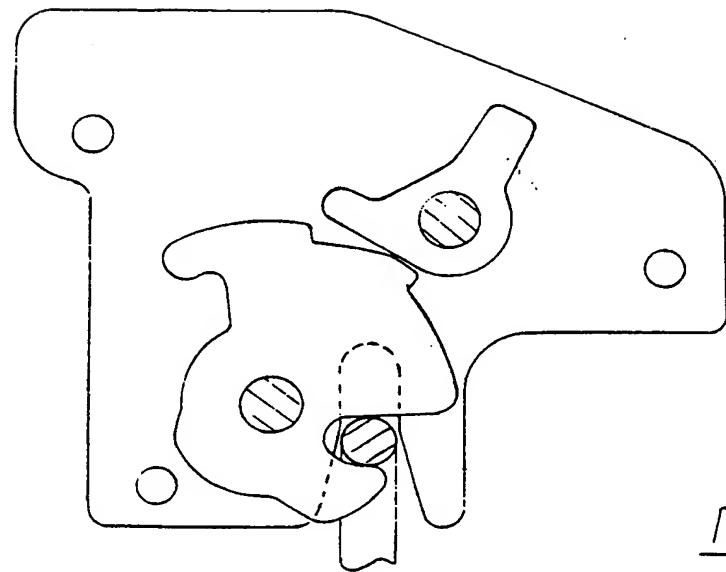


FIG - 4

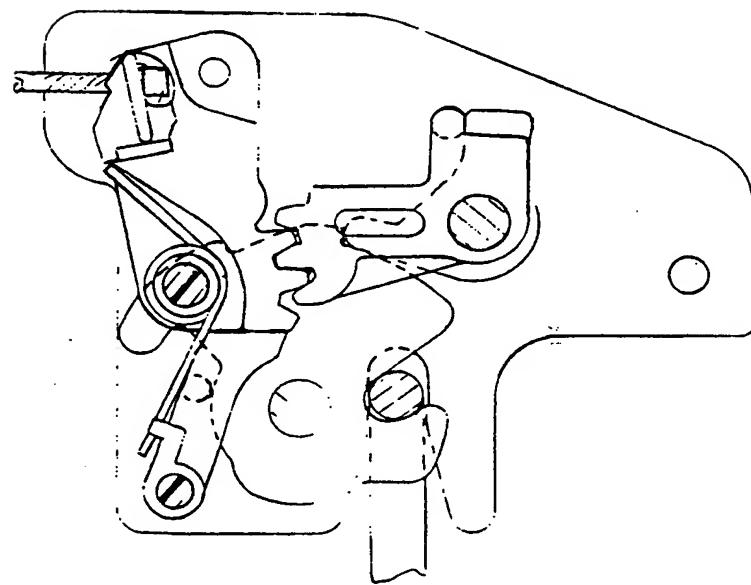


FIG - 5

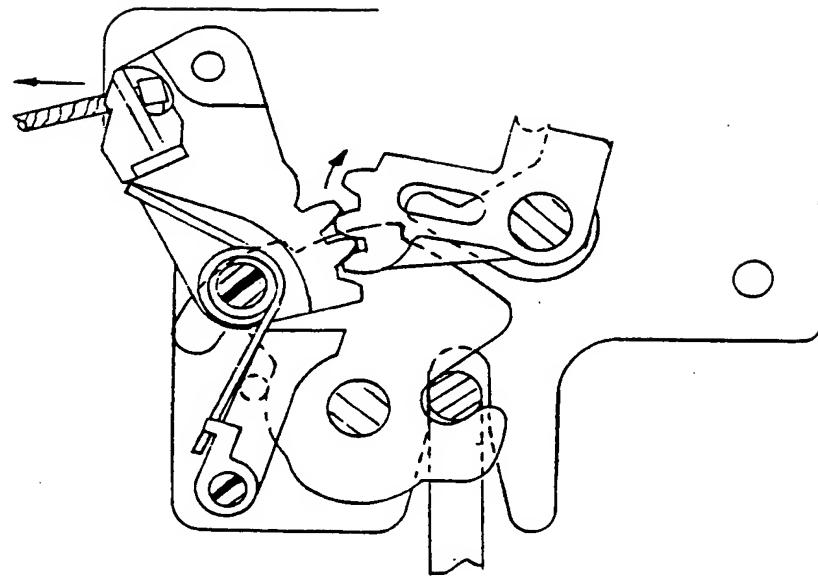


FIG-6

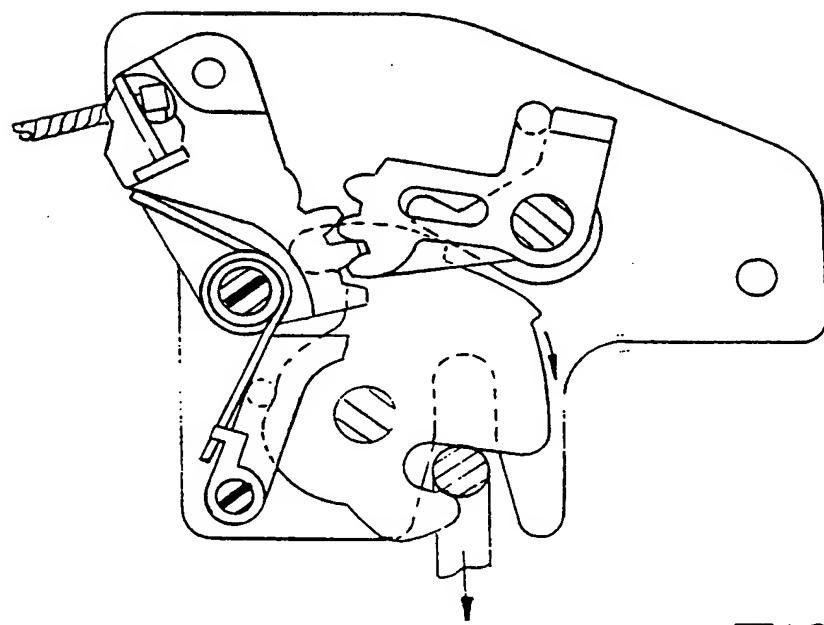


FIG-7

## INTERNATIONAL SEARCH REPORT

Application No.

US 94/10841

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 E05B65/19

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 E05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,4 763 936 (ROGAKOS ET.AL.) 16 August 1988	1-4,6,8
A	see column 1, line 44 - column 2, line 28 see column 2, line 55 - column 5, line 2 see column 5, line 56 - column 7, line 41 see column 8, line 10 - column 9, line 41; figures 1-6 ---	5,7
X	GB,A,2 155 535 (KIEKERT GMBH & CO KOMMANDITGESELLSCHAFT) 25 September 1985	1-4,6,8
A	see page 1, line 89 - page 2, line 80; figures ---	5,7
X	DE,A,38 01 581 (BOMORO BOCKLENBERG & MOTTE GMBH & CO KG, ET.AL.) 31 October 1988	1-3,6,8
A	see column 2, line 24 - column 6, line 46; figures ---	4,5
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## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US 94/10841

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP,A,0 510 843 (ROCKWELL AUTOMOTIVE BODY SYSTEMS UK LTD) 28 October 1992 see column 2, line 8 - column 5, line 15; figures -----	1-4,6-8

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No  
PCT/US 94/10841

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-4763936	16-08-88	NONE		
GB-A-2155535	25-09-85	DE-A-	3406116	22-08-85
		FR-A, B	2559828	23-08-85
DE-A-3801581	13-10-88	FR-A-	2631070	10-11-89
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		US-A-	5236234	17-08-93

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